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EXAMINER	
BECK, ALEXANDER S	
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/811,310	BERKLEY ET AL.	
	Examiner	Art Unit	
	Alexander S. Beck	2629	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on 22 October 2007.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-10,12-30,33,38,39,42 and 49-56 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) 18-25 is/are allowed.

6)☒ Claim(s) 1-3,5-10,12-17,26-30,33,38,39,42 and 49-54 is/are rejected.

7)☒ Claim(s) 4,55 and 56 is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on 26 March 2004 is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1. Acknowledgment is made of the amendment filed by the applicant ("Amendment," filed Oct. 22, 2007), in which: claims 9, 12, 13 and 38 are amended; claims 34-37, 55 and 56 are cancelled; and the rejections of the claims are traversed. Applicant's request for reconsideration of the finality of the rejection of the last Office action (mailed on Aug. 22, 2007) is persuasive and, therefore, the finality of that action is withdrawn. Claims 1-10, 12-30, 33, 38, 39, 42 and 49-56 are currently pending and an Office action on the merits follows.

Claim Objections

2. Claims 55 and 56 are objected to because of the following informalities: Claims 55 and 56 depend from claims 34 and 35, respectively. However, claims 34 and 35 are cancelled in the Amendment. It is the examiner's suggestion that claims 55 and 56 be cancelled as well.

3. Claim 39 is objected to because of the following informalities: There is insufficient antecedent basis for the limitation "the measuring rotation step" at line 1. It is the examiner's suggestion that the limitation be amended to recite, "the measuring ~~rotation~~ step".

Claim Rejections - 35 USC § 112

4. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

5. Claims 29, 30 and 33 are rejected under 35 U.S.C. 112, first paragraph, as based on a disclosure which is not enabling. The establishment of an initial value prior to measuring a change of cable length between the tool and each respective anchor point is critical or essential to the practice of the invention, but not included in the claim is not enabled by the disclosure. See _In re Mayhew_, 527 F.2d 1229, 188 USPQ 356 (CCPA 1976). Claim 29 recites measuring a change of cable length, and establishing an initial length of cable by storing a value indicative of a known length of each of the cables during a shutdown procedure and recovering the values during a startup procedure. However, the establishment of an initial value of the cable lengths is critical and essential for the purposes of measuring a change of cable length from a starting position (e.g., the initial value).

Claim Rejections - 35 USC § 103

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

6. Claims 1, 3, 5, 6, 10, 29, 30 and 33 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 5,305,429 to Sato et al. ("Sato") in view of U.S. Patent No. 6,587,749 to Matsumoto ("Matsumoto").

As to claim 1, Sato discloses a haptic interface device in Figures 1-3 to provide haptic interaction to a user manipulating a tool, the haptic interface device comprising: an attachment point (10); a first cable (12-1) having a first and a second end, the first end coupled to the attachment point; a first tool translation effecter device (44, 46, 48) having coupled thereto the second end of the first cable such that, as the attachment point moves, the first cable is retracted or paid out accordingly by the first tool translation effecter device, the first tool translation effecter device including controlling means (44, 46, 48)

for selectively varying a tension on the first cable; metering means (42) for metering the first cable as it is retracted and paid out; and establishing means (Figure 2) for establishing, during an initialization procedure, a distance between the first tool translation effecter device and the attachment point (e.g., initially when no tension is applied via 44, 46, 48 and the user interface tool is in a starting position) (Sato, col. 4, ll. 6-56; see also col. 6, l. 6 – col. 7, l. 13).

Sato does not disclose expressly a brake configured to lock the first tool translation effecter device when electric current is removed therefrom. Matsumoto discloses an electronic tool device connected to a computer, the tool device comprising a holding brake to hold the tool device's position when a power supply is turned off (e.g., electric current is removed therefrom) (Matsumoto, col. 1, ll. 13-15).

All of the component parts are known in Sato and Matsumoto. The only difference is the combination of the "old elements" together by mounting them in a single interface device. Thus, it would have been obvious to a person having ordinary skill in the art to include a holding brake taught by Matsumoto into the haptic interface device as shown in Sato, since the operation of the holding brake is in no way dependent on the operation of the other equipment of the electronic tool device, and a holding brake could be used in combination with the haptic interface device of Sato to achieve the predictable result of locking the cables when current is removed therefrom. Moreover, the suggestion/motivation for doing so would have been to prevent damage and wear-and-tear of the haptic interface by locking movement of the translation effecter device when not in use, thereby reducing maintenance of the same, as one of ordinary skill in the art would readily appreciate.

As to claim 3, Sato discloses wherein the establishing means includes a controller configured to direct the first tool translation effecter device (44, 46, 48) to retract, during an initialization procedure, the first cable (12-1) until the attachment point (10) is at a

selected position relative to the first tool translation effecter device (e.g., initially when no tension is applied via 44, 46, 48 and the user interface tool is in a starting position) (Sato, col. 4, ll. 6-56).

As to claim 5, Sato discloses wherein the establishing means includes at least one sensor (42, Figure 2) configured to determine a position of the attachment point (10) relative to the first tool translation effecter device (Sato, col. 4, ll. 6-27; see also col. 6, l. 6 - col. 7, l. 13).

As to claim 6, Sato discloses wherein the establishing means includes means for reestablishing the distance from time to time during operation (e.g., updating section) (Sato, col. 7, ll. 14-33).

As to claim 10, Sato discloses second and third cables (12-2, 12-3) coupled at respective first ends to the attachment point (10); and second and third tool translation effecter devices (44, 46, 48) positioned in a triangular configuration relative to each other and to the first tool translation effecter device (Sato, Figs. 1 and 3).

As to claim 29, Sato discloses a method, comprising: applying a selectively variable tension to each of a plurality of cables (12) having respective first and second ends, each of the plurality of cables coupled at its respective first end to a tool (10), and at its respective second end to a respective anchor point (P); and measuring a change of cable length between the tool and each respective anchor point (Sato, col. 4, ll. 6-56; see also col. 6, l. 6 – col. 7, l. 13). Furthermore, Sato discloses establishing an initial length of cable between the tool (10) and each of the anchor points (P), including during a shutdown procedure storing a value indicative of a known length of each of the cables in a memory, and recovering the value indicative of the known length of each of the cables

from the memory during a startup procedure. For example, Sato discloses that a changing position can be measured in real time, in part, by giving an *initial value* of the length from the fulcrum 14 of the line 12 to the instruction point 10 (Sato, col. 4, ll. 22-27). Thus, it is inherently suggested by Sato that this initial value is needed immediately after a startup procedure once the interface device is turned on in order to calculate a changing position in real time. Moreover, it is inherently suggested that this initial value must be *stored* in a memory at all times, including at times during a shutdown procedure, such that it may be recovered during the startup procedure to be used in future calculations.

Sato does not disclose expressly locking each of the plurality of cables at the respective anchor point during a shutdown procedure. Matsumoto discloses an electronic tool device connected to a computer, the tool device comprising a holding brake to hold the tool device's position when a power supply is turned off (e.g., shutdown) (Matsumoto, col. 1, ll. 13-15).

All of the component parts are known in Sato and Matsumoto. The only difference is the combination of the "old elements" together by mounting them in a single interface device. Thus, it would have been obvious to a person having ordinary skill in the art to include a holding brake taught by Matsumoto into the haptic interface device of Sato, since the operation of the holding brake is in no way dependent on the operation of the other equipment of the electronic tool device, and a holding brake could be used in combination with the haptic interface device of Sato to achieve the predictable result of locking the cables when current is removed therefrom. Moreover, the suggestion/motivation for doing so would have been to prevent damage and wear-and-tear of the haptic interface by locking movement of the translation effecter device when not in use, thereby reducing maintenance of the same, as one of ordinary skill in the art would readily appreciate. And lastly, to provide brakes to each of the plurality of cables would have been within the purview of one of ordinary skill in the art because such a

modification would be necessary to prevent movement of the attachment point and to effectively realize a holding brake in the haptic interface device.

As to claim 30, Sato discloses wherein establishing an initial length of cable comprises moving the tool in turn to each of the anchor points such that the length of cable between the tool and the respective anchor point is effectively zero; wherein it is understood that the movement of a tool is limited by vertices (anchors) and the initial lengths can be determined from the equation (1) when moving the tool up to the respective anchors, i.e., to bringing the tool effectively to the point P_0, where $l_0=0$ and l_1, l_2 and l_3 will constitute the initial lengths, then to the points P_1-P_3, etc.

As to claim 33, Sato discloses wherein establishing an initial length of cable comprises: tracking a position of the tool; and correlating the position of the tool with known positions of the anchor points (e.g., as in the case of establishing any tracking lengths and positions of the tool).

7. Claims 9, 12-14, 16, 17, 26-28, 38, 39, 42, 49, 51, 52 and 54 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sato in view of U.S. Patent No. 6,104,380 to Stork et al. ("Stork").

As to claim 9, Sato discloses a haptic interface device in Figures 1-3 to provide haptic interaction to a user manipulating a tool, the haptic interface device comprising: an attachment point (10) configured to receive the tool; a plurality of not more than four cables (12-1, 12-2, 12-3, 12-4), each cable coupled at a respective first end to the attachment point; a plurality of tool translation effecter devices (44, 46, 48), each having coupled thereto a second end of a respective one of the plurality of cables such that, as the attachment point moves relative to that tool translation effecter device, the cable

coupled thereto is retracted or paid out accordingly (Sato, col. 4, ll. 6-27). Each tool translation effecter device is configured to selectively vary a tension on the cable coupled thereto and to meter the cable as it is retracted and paid out; and a sensor array (42) associated with the attachment point and configured to provide signals corresponding to an orientation of the tool (Sato, col. 6, l. 6 – col. 7, l. 13).

Sato does not disclose expressly wherein the sensor provides signals corresponding to at least one of roll, pitch, and yaw of the tool. Stork discloses an interface device, the interface device comprising a display (10) and a hand manipulated tool (150) having a sensor array, the sensor array configured to provide and wirelessly transmit signals corresponding to at least one of roll, pitch, and yaw of the tool (Stork, col. 5, ll. 46-57).

All of the component parts are known in Sato and Stork. The only difference is the combination of the "old elements" together by mounting them within a single interface device. Thus, it would have been obvious to one having ordinary skill in the art to include the sensor array taught by Stork into the hand manipulated tool of Sato, since the operation of the sensor array is in no way dependent on the operation of the other equipment of the hand manipulated tool, and a sensor array could be used in combination with a hand manipulated tool in any interface device to achieve the predictable results of providing signals corresponding to at least one of roll, pitch, and yaw. Moreover, the suggestion/motivation for doing so would have been to provide the haptic interface device of Sato with a greater degree of sensitivity, as one of ordinary skill in the art would appreciate.

As to claim 49, Sato discloses in Figures 1-3 wherein each of the plurality of tool translation effecter devices (44, 46, 48) is positioned relative to each other such that each tool translation effecter devices occupies a vertex of a tetrahedron (Sato, col. 4, ll. 6-27).

As to claim 51, Sato discloses establishing means for establishing, during an initialization procedure, a distance between each of the tool translation effecter devices (44, 46, 48) and the attachment point (e.g., initially when no tension is applied via 44, 46, 48 and the user interface tool is in a starting position) (Sato, col. 4, ll. 6-56).

As to claim 52, Sato as modified by Stork teaches/suggests wherein the sensor array is configured to provide signals corresponding to each of a roll, a pitch, and a yaw of the tool (Stork, col. 5, ll. 46-57).

As to claim 12, Sato discloses a haptic device for operation by a user in Figures 1-3, comprising: a user interface tool (10) configured to be manipulated by the user and moved within a volume of space, and including a sensor array (42) configured to detect rotation of the user interface tool around an axis (e.g., the tool rotating about an axis in orbit); a first, a second, a third, and a fourth tool translation effecter device (14-1, 14-2, 14-3, 14-4), each coupled to support structure positions such that the first, second, third, and fourth tool translation effecter devices define between them a tetrahedron within the volume of space, each of the tool translation effecter devices including a respective spool (38) and a respective encoder (42) configured to provide a signal corresponding to rotation of the respective spool; and a first, a second, a third, and a fourth cable (44, 46, 48) each having a respective first and a respective second end, the first end of each of the first, second, third, and fourth cables coupled to the user interface tool and the second end of the first, second, third, and fourth cables wound an unwound on the spool of a respective one of the tool translation effecter devices (Sato, col. 3, l. 59 – col. 4, l. 27; see also col. 6, l. 6 – col. 7, l. 13).

Sato does not disclose expressly wherein the sensor provides signals corresponding to at least one of roll, pitch, and yaw of the tool. Stork discloses an interface device, the interface device comprising a display (10) and a hand manipulated

tool (150) having a sensor array, the sensor array configured to provide and wirelessly transmit signals corresponding to at least one of roll, pitch, and yaw of the tool (Stork, col. 5, ll. 46-57).

All of the component parts are known in Sato and Stork. The only difference is the combination of the "old elements" together by mounting them within a single interface device. Thus, it would have been obvious to one having ordinary skill in the art to include the sensor array taught by Stork into the hand manipulated tool of Sato, since the operation of the sensor array is in no way dependent on the operation of the other equipment of the hand manipulated tool, and a sensor array could be used in combination with a hand manipulated tool in any interface device to achieve the predictable results of providing signals corresponding to at least one of roll, pitch, and yaw. Moreover, the suggestion/motivation for doing so would have been to provide the haptic interface device of Sato with a greater degree of sensitivity, as one of ordinary skill in the art would appreciate.

As to claim 13, Sato as modified by Stork teaches/suggests wherein the sensor array is configured to detect roll, pitch, and yaw of the user interface tool (Stork, col. 5, ll. 46-57).

As to claims 14 and 42, Sato discloses a processor system coupled to receive the signals from the sensor array and the respective encoders (e.g., 42), the processor system configured to determine movement of the tool (10) therefrom. (Sato, Fig. 2).

As to claim 26, Sato discloses wherein the processor system is configured to maintain a virtual environment within which the user interface tool (10) is operated, and to provide feedback from the virtual environment (e.g., via 44, 46, 48) to the user interface tool (Sato, col. 6, l. 30 – col. 7, l. 41).

As to claim 27, Sato discloses a remote tool (e.g., graphic on display), and wherein the processor system is configured to control operation of the remote tool in accordance with the movement and orientation of the user interface tool (10) (Sato, col. 6, l. 30 – col. 7, l. 41).

As to claim 28, Sato discloses wherein the processor system is configured to provide feedback from the remote tool to the user interface tool (10) (e.g., via 44, 46, 48) (Sato, col. 6, l. 30 – col. 7, l. 41).

As to claim 16, Sato discloses wherein each of the first, second, third, and fourth tool translation effecter devices further comprises: a motor (44, 46, 48) coupled to the respective spool (38), each of the motors operable to selectively apply tension to the respective cable (14-1, 14-2, 14-3, 14-4) (Sato, col. 6, l. 65 – col. 7, l. 7).

As to claim 17, Sato discloses wherein the processor system is configured to establish an initial position of the tool by retracting, in turn, each of the first, the second, the third, and the fourth cables (14-1, 14-2, 14-3, 14-4) to a known length position (e.g., initially when no tension is applied via 44, 46, 48 and the user interface tool is in a starting position) (Sato, col. 4, ll. 6-56).

As to claim 54, Sato discloses wherein the device comprises no more than four cables (14-1, 14-2, 14-3, 14-4) (Sato, Figure 1).

As to claim 38, Sato discloses a method in Figures 1-3, comprising: applying tension to each of four cables (14-1, 14-2, 14-3, 14-4), each cable having a first end coupled to a tool (10) and having a second end coupled to a respective vertex of a

tetrahedron such that, as the tool is moved closer to any of the vertices the respective cables are drawn in at the respective vertices, and as the tool is moved away from any of the vertices, the respective cables are fed out from the respective vertices; measuring a length of cable drawn in or fed out at each of the vertices; deriving a change of position of the tool on the basis of the measured length to each of the vertices of the tetrahedron; and measuring rotation of the tool about an axis (e.g., the tool rotating about an axis in orbit) by receiving a signal from a sensor (42) operatively coupled to the tool (Sato, col. 4, ll. 6-27; see also col. 6, l. 6 – col. 7, l. 13).

Sato does not disclose expressly measuring at least one of roll, pitch, and yaw of the tool by receiving a signal from a sensor operatively coupled to the tool. Stork discloses an interface device, the interface device comprising a display (10) and a hand manipulated tool (150), wherein the interface device measures at least one of roll, pitch, and yaw of the tool by receiving a signal from a sensor operatively coupled to the tool. (Stork, col. 5, ll. 46-57).

All of the component parts are known in Sato and Stork. The only difference is the combination of the "old elements" together by mounting them within a single interface device. Thus, it would have been obvious to one having ordinary skill in the art to include the sensor array taught by Stork into the hand manipulated tool of Sato, since the operation of the sensor array is in no way dependent on the operation of the other equipment of the hand manipulated tool, and a sensor array could be used in combination with a hand manipulated tool in any interface device to achieve the predictable results of providing signals corresponding to at least one of roll, pitch, and yaw. Moreover, the suggestion/motivation for doing so would have been to provide the haptic interface device of Sato with a greater degree of sensitivity, as one of ordinary skill in the art would appreciate.

As to claim 39, Sato as modified by Stork teaches/suggests wherein the measuring step comprises measuring rotation of the tool about three mutually perpendicular axes (Stork, col. 5, ll. 46-57).

8. Claim 50 and 53 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sato and Stork as applied to claims 9, 12-14, 16, 17, 26-28, 38, 39, 42, 49, 51, 52 and 54 above, and further in view of Matsumoto.

As to claim 50, Neither Sato nor Stork disclose expressly wherein each of the plurality of tool translation effecter devices includes a brake configured to lock the respective tool translation effecter device while the haptic interface device is powered down. Matsumoto discloses an electronic tool device connected to a computer, the tool device comprising a holding brake to hold the tool device's position when a power supply is turned off (e.g., powered down) (Matsumoto, col. 1, ll. 13-15).

All of the component parts are known in Sato, Stork and Matsumoto. The only difference is the combination of the "old elements" together by mounting them in a single interface device. Thus, it would have been obvious to a person having ordinary skill in the art to include a holding brake taught by Matsumoto into the modified haptic interface device as suggested by Sato and Stork, since the operation of the holding brake is in no way dependent on the operation of the other equipment of the electronic tool device, and a holding brake could be used in combination with the haptic interface device of Sato to achieve the predictable result of locking the cables when current is removed therefrom. Moreover, the suggestion/motivation for doing so would have been to prevent damage and wear-and-tear of the haptic interface by locking movement of the translation effecter device when not in use, thereby reducing maintenance of the same, as one of ordinary skill in the art would readily appreciate.

As to claim 53, neither Sato nor Stork disclose expressly a first, a second, a third, and a fourth brake coupled to respective ones of the first, the second, the third, and the fourth tool translation effecter devices and configured, when engaged, to prevent rotation of the spools associated with the respective tool translation effecter devices. Matsumoto discloses an electronic tool device connected to a computer, the tool device comprising a holding brake to hold the tool device's position when a power supply is turned off (e.g., powered down) (Matsumoto, col. 1, ll. 13-15).

All of the component parts are known in Sato, Stork and Matsumoto. The only difference is the combination of the "old elements" together by mounting them in a single interface device. Thus, it would have been obvious to a person having ordinary skill in the art to include a holding brake taught by Matsumoto into the modified haptic interface device as suggested by Sato and Stork, since the operation of the holding brake is in no way dependent on the operation of the other equipment of the electronic tool device, and a holding brake could be used in combination with the haptic interface device of Sato to achieve the predictable result of locking the cables when current is removed therefrom. Moreover, the suggestion/motivation for doing so would have been to prevent damage and wear-and-tear of the haptic interface by locking movement of the translation effecter device when not in use, thereby reducing maintenance of the same, as one of ordinary skill in the art would readily appreciate. As such, the resultant embodiment comprising a brake configured to prevent rotation of the spools associated with the translation effecter devices.

Furthermore, to provide second, third and fourth brakes to the second, third and fourth translation effecter devices would have been within the purview of one of ordinary skill in the art because such a modification would be necessary to prevent movement of the attachment point and to effectively realize a holding brake in the haptic interface device.

9. Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sato and Stork as applied to claims 9, 12-14, 16, 17, 26-28, 38, 39, 42, 49, 51, 52 and 54 above, and further in view of U.S. Patent No. 5,440,476 to Lefkowitz et al. ("Lefkowitz").

As to claim 15, note the above discussion of Sato and Stork with respect to claim 12. Neither Sato nor Stork disclose expressly compensating for changes in effective diameters of the spools of the first, second, third, and fourth tool translation effecter devices due to changing thickness of cable on each of the spools as the respective cable is wound and unwound from the respective spool.

Lefkowitz brings up attention to a problem of changing ratio when using spools and cable for 3D positioning an object and suggests using compensating means (Lefkowitz, col. 4, ll. 10-17). At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to further modify the teachings of Sato and Stork such that compensating means were implemented, as taught/suggested by Lefkowitz, for the purpose of compensating a change in spool diameter and therefore improve the accuracy of measurements (Lefkowitz, col. 4, ll. 10-17).

10. Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sato and Matsumoto as applied to claims 1, 3, 5, 6, 10, 29, 30 and 33 above and in further view of Lefkowitz and an article titled "*Design of Tension Based Haptic Interface: SPIDAR-G*", DSC-Vol. 69-2, Proceedings of ASME, 5-10 November 2000 (the reference provided with applicant's IDS filed on December 8, 2006, hereinafter "Kim").

As to claim 2, Sato discloses wherein the controlling means includes a spool and a motor coupled to rotatably drive the spool, the motor and spool selectively operable to wind and unwind the second end of the first cable (Sato, col. 6, l. 65 – col. 7, l. 7). However, neither Sato nor Matsumoto discloses expressly compensating for changes in

effective diameters of the spools of the first, second, third, and fourth tool translation effecter devices due to changing thickness of cable on each of the spools as the respective cable is wound and unwound from the respective spool. Lefkowitz brings up attention to a problem of changing ratio when using spools and cable for 3D positioning an object and suggests using compensating means (Lefkowitz, col. 4, ll. 10-17). At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to further modify the teachings of Sato and Stork such that compensating means were implemented, as taught/suggested by Lefkowitz, for the purpose of compensating a change in spool diameter and therefore improve the accuracy of measurements (Lefkowitz, col. 4, ll. 10-17).

However, neither Sato, Matsumoto nor Lefkowitz disclose expressly counting means for counting fractions of rotations of the spool. Sato determines the changing position of a tool based on a changing diameter of the pulleys connected to the tool from a cable (Sato, col. 4, ll. 18-21). Kim determines the changing position of a tool based on fractions of rotations of a pool connected to the tool from a cable (Kim, p. 1246; see also equations). Because both Sato and Kim teach methods of determining the position of a tool based on a spool/pulley connected to the tool from a cable, it would have been obvious to one skilled in the art to substitute one method for the other to achieve the predictable result of determining a changing position of the tool. Moreover, the suggestion/motivation for doing so would have been to provide an alternative way for measuring the changing position of a tool, as one of ordinary skill in the art would appreciate.

11. Claims 7 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sato and Matsumoto as applied to claims 1, 3, 5, 6, 10, 29, 30 and 33 above, and further in view of Stork.

As to claims 7 and 8, Sato discloses second, third, and fourth cables coupled at respective firs tends to the attachment point; and second, third, and fourth tool translation effecter devices positioned, relative to each other and to the first tool translation effecter device, such that each of the first, second, third, and fourth tool translation effecter devices occupies a vertex of a tetrahedron (Sato, col. 4, ll. 6-27; see also col. 6, l. 6 – col. 7, l. 13).

Neither Sato nor Matsumoto discloses expressly a sensor array at the attachment point configured to provide signals corresponding to an orientation of the attachment point, wherein the sensor array is configured to provide signals corresponding to roll, pitch, and yaw of the attachment point. Stork discloses an interface device, the interface device comprising a display (10) and a hand manipulated tool (150) having a sensor array, the sensor array configured to provide and wirelessly transmit signals corresponding to roll, pitch, and yaw of the tool (Stork, col. 5, ll. 46-57).

All of the component parts are known in Sato, Matsumoto and Stork. The only difference is the combination of the "old elements" together by mounting them within a single interface device. Thus, it would have been obvious to one having ordinary skill in the art to include the sensor array taught by Stork into the hand manipulated tool of Sato, since the operation of the sensor array is in no way dependent on the operation of the other equipment of the hand manipulated tool, and a sensor array could be used in combination with a hand manipulated tool in any interface device to achieve the predictable results of providing signals corresponding to roll, pitch, and yaw. Moreover, the suggestion/motivation for doing so would have been to provide the haptic interface device of Sato with a greater degree of sensitivity, as one of ordinary skill in the art would appreciate.

Response to Arguments

12. Applicant's arguments filed Aug. 22, 2007, with respect to claim 1 has been fully considered but they are not persuasive.

Applicant argues that neither Matsumoto nor Sato suggest any advantages to such a modification (Amendment, pp. 12-13). Examiner respectfully disagrees. "There are three possible sources for a motivation to combine references: the nature of the problem to be solved, the teachings of the prior art, and the knowledge of persons of ordinary skill in the art." *In re Rouffet*, 149 F.3d 1350, 1357, 47 USPQ2d 1453, 1457-58 (Fed. Cir. 1998). With respect to proposed combination of claim 1, it is the examiner's position that the suggestion/motivation for doing so would have been to prevent damage and wear-and-tear of the haptic interface by locking movement of the translation effecter device when not in use, thereby reducing maintenance of the same, as would have been apparent and within the knowledge of persons of ordinary skill in the art.

Applicant argues that the proposed modification of Sato in view of Matsumoto is not obvious because such a combination would make Sato's system significantly more complex, expensive, less energy efficient and less accurate. Examiner respectfully disagrees. The fact that a combination would not be made by businessmen for economic reasons does not mean that a person of ordinary skill in the art would not make the combination because of some technological incompatibility. *In re Farrenkopf*, 713 F.2d 714, 219 USPQ 1 (Fed. Cir. 1983). Moreover, in solving engineering related problems, often times desired gains result in certain drawbacks. It is a matter of preference as to what variables to sacrifice in achieving these desired gains. For example, it is argued by the applicant that the proposed combination of Sato and Matsumoto would result in certain drawbacks such as complexity and a decrease in accuracy and energy efficiency. However, the proposed combination would also result in a reduction in overall maintenance, as detailed in the rejection of the claim. Thus, if one of ordinary skill in the art was concerned with reducing overall maintenance of the haptic interface device, the

proposed modification would have been obvious despite the possibility of certain drawbacks.

13. Applicant's arguments filed Aug. 22, 2007, with respect to claim 29 has been fully considered but they are not persuasive. It is the examiner's opinion that a known length of each cable is inherently *stored* in memory at all times, and that this known length is inherently *recovered* during a startup in order to perform measurements in real time. A more detailed explanation is provided in the rejection of claim 29.

14. Applicant's arguments with respect to claims 9, 12 and 38 have been considered but are moot in view of the new grounds of rejection.

Allowable Subject Matter

15. Claims 18-25 are allowed.

16. Claim 4 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. As to claim 4, none of the prior art made of record teaches or suggests a memory configured to *receive* a known distance between the tool translation effecter device and the attachment point after current is removed from the brake, but prior to a complete shutdown of the interface device, and to provide this known distance during a startup procedure.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Alexander S. Beck whose telephone number is (571) 272-7765. The examiner can normally be reached on M-F, 8AM-5PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Sumati Lefkowitz can be reached on (571) 272-3638. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

asb

Nov. 16, 2007

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